1. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 1 hours, the petri dish has 11 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

A. About 54 minutes

B. About 298 minutes

C. About 49 minutes

D. About 326 minutes

E. None of the above

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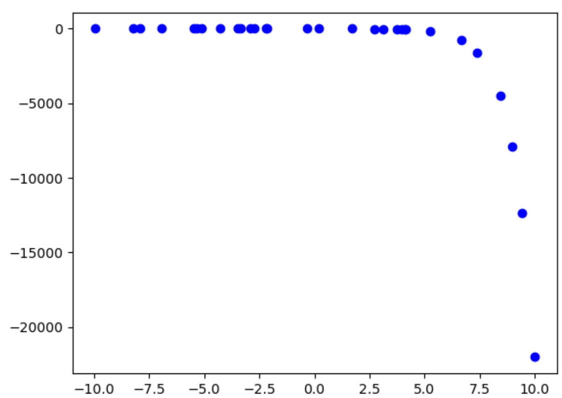
2. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Linear model

C. Logarithmic model

D. Exponential model

E. None of the above

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3. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 100° *C and is placed into a* 18° *C bath to cool. After 39 minutes, the uranium has cooled to* 33° *C.*

A. $k = -0.01239$

B. $k = -0.04864$

C. $k = -0.04356$

D. $k = -0.01284$

E. None of the above

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4. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 578 grams of element X and after 6 years there is 82 grams remaining.

A. About 1 day

B. About 2555 days

C. About 1095 days

D. About 730 days

E. None of the above

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5. Using the scenario below, model the population of bacteria α in terms

of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 3 hours, the petri dish has 842 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

A. About 47 minutes

B. About 132 minutes

C. About 287 minutes

D. About 22 minutes

E. None of the above

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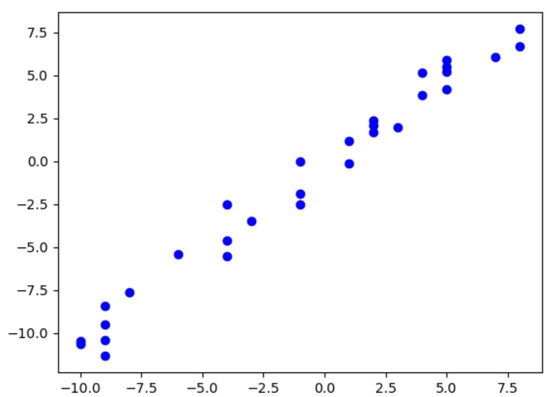
6. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Exponential model

C. Linear model

D. Non-linear Power model

E. None of the above

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7. A town has an initial population of 20000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	20000	19986	19978	19972	19967	19964	19961	19958	19956

A. Exponential

B. Non-Linear Power

C. Linear

D. Logarithmic

E. None of the above

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8. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 545 grams of element X and after 7 years there is 60 grams remaining.

A. About 1 day

B. About 1095 days

C. About 730 days

D. About 3285 days

E. None of the above

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9. A town has an initial population of 90000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	89970	89940	89910	89880	89850	89820	89790	89760	89730

A. Linear

B. Non-Linear Power

C. Logarithmic

D. Exponential

E. None of the above

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10. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 150° *C and is placed into a* 18° *C bath to cool. After 28 minutes, the uranium has cooled to* 82° *C.*

A. $k = -0.02525$

B. $k = -0.03042$

C. $k = -0.03818$

D. $k = -0.02471$

E. None of the above
